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NOTES ON PLEURITIC EFFUSION
IN CHILDHOOD.

BY

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NOTES ON PLEURITIC EFFUSION IN CHILDHOOD.*

THE following notes are based chiefly upon observations made by the authors at the Children's Hospital Great Ormond Street, and at the East London Children's Hospital. We have to thank our respective colleagues for permission to make use of such of their clinical material as we had the advantage, either conjointly or separately, of daily observing.

We do not attempt in this paper anything like a formal or exhaustive consideration of the subject. Such notes as we have to offer are based exclusively on what we have ourselves observed, and are laid down in the following lines :—

- a. The difficulties of diagnosis between pleuritic effusion and other chest affections in childhood ;
- b. The difficulties of diagnosis between serous and purulent effusions.
- c. The natural course of pleuritic effusion in childhood, when unmodified by surgical treatment ;
- d. The methods of treatment which have appeared to us most successful.

a. *Difficulties of Diagnosis between Pleuritic Effusion and other Chest-Affections in Childhood.*—There is very little more difficulty in discriminating lobar pneumonia from pleurisy in children than in adults. It is when we have to do with bronchial catarrh and collapse, with bronchopneumonia, or with the various forms of tuberculosis of the lungs, that difficulty constantly arises. We have repeatedly observed

* Read in the Section of Medicine at the Annual Meeting of the British Medical Association in Manchester, August 1877.

an amount of dulness due solely to collapse of lung, quite equal to that produced by a localised pleuritic effusion. Although it is true that bronchopneumonia and the various forms of tuberculosis of the lung are generally bilateral, we have seen three cases of bilateral empyema and three at least of bilateral serous effusion, undoubtedly inflammatory and not mere hydrothorax. Taking the classical signs of pleuritic effusion, we have seen in one case undoubted bulging and displacement downwards of the liver by lobar pneumonia. On the other hand, the concurrence of considerable retraction of one side of the chest, with a loculated empyema of that side and shrinking of the lung, is very common. It is well known that moderate effusion on the right side may exist, without displacement of the heart's apex to the left. On the other hand, we have seen cases of loculated empyema on the left side, where, in consequence of adhesions, or possibly of concomitant collapse of lung, the heart has not been displaced to the right. The use of the cyrtometer, introduced by Woillez and perfected by Dr. Gee, has almost superseded the old tape-measure as formerly used. We have again and again verified Dr. Gee's observation, that "considerable increase in the sectional area of the chest may occur, and the length of the periphery remain the same, by the passage of the elliptical form into the circular". "Thus with a moderate effusion in one pleura, the measurement is frequently identical with the measurement of the sound side." The essential fact is that, if the effusion be equally distributed, the shape of the transverse section of the affected side tends to assume the semicircle, as cyrtometer tracings show.

Vocal fremitus in children is proverbially weak, and is not always attainable even on the sound side. It is, therefore, no wonder that the discrimination of thickened pleura from limited effusion is often impossible by ordinary methods. With respect to the site of dulness, we have found in many cases the tubular resonance of the compressed lung close to the sternum, instead of in the interscapular region. In one case, we found *post mortem* an empyema, which went round the root of the lung, and which during life had closely simulated, in percussion-signs, a mediastinal tumour. We have also seen two cases of empyema situated between the anterior edge of the lung and the pericardium. We have frequently found empyemata occupying the middle third of the thorax. In these cases, the lower portion of the lung has become fixed to the

chest-wall by adhesions, and, therefore, imparted relative resonance to the surface corresponding to it. This relative resonance at the base is very embarrassing. We have seen three cases during life of double collections of pus, widely separated, but on the same side ; and we have seen at least three similar cases in the *post mortem* room. One case has come under observation of diaphragmatic empyema, closely simulating hepatic abscess ; another case of partially inspissated empyema round the apex of the lung. In view of such anomalous situations for pleuritic effusion, it is obvious that percussion is insufficient for diagnosis. But auscultation is often still less satisfactory. The weak respiratory murmur, heard occasionally over a pneumonic lung, is balanced by the not unfrequent tubular breathing over pleuritic effusion. This, and the delusive character of friction *râle*, were pointed out by Addison thirty years ago, and the auscultation of children abundantly justifies his sagacity. We will only add that, in one case, we heard a typical friction-*râle* over a spot, from which immediately afterwards three ounces of pus were withdrawn. In another case, assumed before death to be tubercular disease of the lung, a subcrepitant *râle*, conducted doubtless from the other side, was heard over what *post mortem* proved to be a loculated empyema.

b. Difficulties of Diagnosis between Serous and Purulent Effusions.—

On this we need say very little. We are quite unable to subscribe to the statement of Bright and Addison, which has passed into ordinary school teaching, “ that in most instances the transition from pleurisy to empyema is sufficiently obvious, the disease quickly giving rise to well-marked symptoms of hectic fever”. We are reluctant to make any general statements on the temperature of the different forms of pleuritic effusion, the variation is so considerable. But at least it may be said that, with cases of serous pleurisy, there is sometimes very marked hectic, whilst with empyema there is often a very moderate degree. Thus in a case of serous pleurisy, the evening temperature ranged from 101.4 deg. Fahr. to 103.4 deg. Fahr., and the morning from 97 deg. Fahr. to 102 deg. Fahr. In another case, the evening temperature ranged from 101.4 deg. Fahr. to 104 deg. Fahr., and the morning from 101 deg. Fahr. to 103 deg. Fahr. We have observed a great many cases of empyema in which the highest evening temperature was 101.5 deg. Fahr. and the morning temperature normal. For many days to-

gether, in many cases, the temperature morning and evening has been normal or subnormal. It has appeared to us that the aspect of the patient—a peculiar anæmia, with an earthy complexion—and, above all, clubbing of the finger-ends, have been the most characteristic features suggesting empyema rather than serous effusion. We have never seen a case of serous effusion accompanied by clubbing, and we have seen very few cases of empyema where it has not been present to some degree, even when the illness has been only of a few weeks' duration. So frequent is the association that, we believe, if a child be seen with general pallor and clubbing of the fingers, one ought to think of empyema rather than of the other causes of clubbing, viz., chronic bone-disease, bronchiectasis, and congenital heart-disease. So far as the ordinary modes of physical examination of the chest are concerned, we know of no means of discriminating serous from purulent effusion, except when the latter has led to localised swelling, which we believe the former never does. There is nothing novel in urging the use of the hypodermic syringe for diagnostic purposes in chest affections; but the practical outcome of the foregoing part of our paper is, that if, as a *matter of routine*, this method were adopted in all cases where the slightest doubt existed, we should less often fall into error.

1. *The Natural Course of Pleuritic Effusion in Childhood, when unmodified by Surgical Treatment.*—Small serous effusions generally become absorbed, and moderate effusions likewise. We wish here to repeat, with respect to serous pleurisy, what we before remarked respecting empyema, viz., that retraction of the side is not to be taken as a positive proof that absorption has taken place. In children, so complete appears to be the power of re-expansion of lung after removal of fluid, that the very fact of observing great retraction has often been to us a suggestion in favour of some fluid still being present. Of the results of large serous effusions, unmodified by operation, we have no experience to offer. We are at a loss to understand the data upon which any limit of time can be enunciated as to when a serous effusion will become purulent. Thus, after two months' illness, we have ascertained the presence of serum in the pleura; and again, in the same case, forty-two days afterwards. In two other cases, we have found serum to be present in the pleura, and three weeks afterwards still found serum. In one child, who for more than two months had had signs of effusion in one pleura,

we found fourteen ounces of serum at the necropsy. Alongside of these facts, we have to consider the extreme frequency of purulent effusion in children. Thus, out of forty-four consecutive cases of pleurisy admitted as in-patients at Great Ormond Street, twenty-seven were empyemata. Taking another series of sixteen cases, fourteen were empyemata. Hence the question has frequently suggested itself, whether many of these cases were not empyemata *ab initio*. The shortest period, however, from the commencement of the illness, at which we have been able to establish the presence of pus, has been fourteen days. In whatever way an empyema may start, we have no doubt as to the disastrous issue of a large number of cases when left to themselves. The dangers, in our experience, have been due to asthenia rather than asphyxia. Marked lividity and dyspnoea, we have seldom observed. Progressive emaciation, anæmia, with characteristic sallowness of face, languor, shortness of breath on effort; cough, often absent for days together, sometimes spasmodic, attended now and then with vomiting and at other times with fœtor of breath; clubbing of fingers, and obstinate diarrhoea, have been the chief clinical features of such cases. In the light of *post mortem* experience, we are quite certain that true inspissation of an empyema is a rare event. We have only seen one such case. It occurred at the apex. There was some pasty material, with calcified nodules in it; elsewhere, adhesion. It is important to note that the child died with tuberculosis. Concerning the relations of empyema and tuberculosis, we have only seen one case in which the empyema appeared to owe its origin to the presence of tubercle in the pleura. In the majority of cases, we believe that tubercular pleurisy is a *serous* pleurisy, and generally slight. Judging from the few other cases of empyema, associated with tuberculosis, which we have seen in the *post mortem* room, it has appeared to us more likely that the tuberculosis was secondary to the empyema than the reverse. Of the various modes of spontaneous evacuation of empyema, rupture through the lung has appeared to us the least unfavourable. We have seen it occur in eight cases, where there had been no operative interference. On two of these, we made *post mortem* examinations. In neither, had evacuation of the cavity been complete. In one, the empyema had also ulcerated through the diaphragm and set up localised peritonitis. In the other case, the cavity contained some air; the lung was col-

lapsed and carnified; ulceration of cartilage had occurred, amyloid disease, and tuberculosis. One of the others imperfectly recovered, after symptoms of gangrene of the lung. Two have survived, with extreme retraction and unexpanded lung. Another is very slowly improving. Two have made really good recoveries. We may remark that, in a number of cases treated by paracentesis, purulent material has been expectorated. We think it is too readily assumed that in such cases the pus always comes from the empyema-cavity. In some, no doubt, such is the case; but in others it has appeared to us probable that, owing to the impaired expansion of lung, conditions similar to those of bronchiectasis have obtained, and given rise to purulent sputum. With respect to spontaneous evacuation by external opening, our experience does not supply us with a single really good result. In the majority of cases which we have seen, pointing has occurred somewhere between the nipple and clavicle. This position is obviously unfavourable to complete draining. It is associated with ulceration of pleura, necrosis of rib or rib-cartilage, and frequently coexistent with abscess, and unhealthy ulceration of the adjacent tissues. Furthermore, the subsequent deformity in these cases has seemed to us more permanent and more extensive than in any others. It is held that permanent fistulæ are more liable to be associated with amyloid disease in the viscera, when there is disease of rib, than when there is not. We are bound to state, however, that we have made a *post mortem* examination on one case, in which, in spite of suppuration continued during nine months, and extensive rib-necrosis, we yet found no amyloid changes.

d. The Methods of Treatment which have appeared to us most Successful.—*I. Serous Effusions.*—We have already insisted on the value, for diagnostic purposes, of the exploratory puncture. We wish now to urge its claim as a therapeutic measure. We have instances in which it is impossible to resist the conviction, that the removal of a very small quantity of fluid has been rapidly followed by absorption. This was most conspicuous in a case where an effusion which, in spite of mercurials and diuretics, had continued to increase, very quickly became absorbed after a tentative puncture for *diagnostic purposes*. In another case of moderate effusion, two days after the withdrawal of a small quantity of serum, the effusion had so completely disappeared

that it was impossible to withdraw any more.* When the history is recent, and the effusion serous and small or moderate in amount, we prefer to abstain from further operative interference. When three weeks relapse without improvement, we recommend the additional removal of a small quantity, either by the hypodermic syringe or the aspirator. If the effusion be considerable, we believe that it is right to perform paracentesis at once; not only to relieve dyspnoea, but to give the lung a chance of re-expansion before adhesions bind it down. In a case where seventy-two ounces were removed from the chest by aspiration, from a boy nine years old, the lung immediately expanded and there was no reaccumulation. In another case, from a boy six years old, twenty-two ounces were removed, and there was also no re-accumulation. We think paracentesis should be performed quite irrespectively of pyrexia. As to drugs, although we have the strongest belief in the value of diuretics in the treatment of passive effusions into the peritoneal cavity, we cannot say that we have seen any benefit whatever from their use in pleuritic effusion; and, considering how frequently small serous effusions into the pleura in children are associated with the tubercular diathesis, we should be exceedingly chary in subjecting any such cases to a mercurial treatment. In young children, the use of blisters is not without grave risks of producing troublesome sores. We have not seen any harm result from the external application of iodine; indeed, it has seemed to us that its use, combined with the internal administration of iodide of potassium, has produced benefit. In this, as in every other wasting disease of childhood, cod-liver oil is invaluable.

2. *Purulent Effusion*.—If the exploratory puncture reveal the presence of pus, it is recommended to withdraw *as much as possible* with the hypodermic syringe. We have found great advantage in using a syringe capable of holding at least two drachms. Occasionally this will remove all that is present in one spot; moreover, gently moving the needle will give information as to the size of the cavity. It is quite marvellous to observe the rapid improvement which frequently follows the emptying of a very small

* Such a result would not be without its analogies. The puncturing with a fine needle of hydroceles in young children is often followed by absorption. The increase of bulk which occurs for a day or two is doubtless due to the starting of an inflammatory process, which ultimately effects the cure.

collection of pus. We have found by experience the necessity of bearing in mind the possible existence of multiple collections of pus completely separated by adhesions. If the quantity of pus removed be incommensurate with the extent and intensity of the dulness, subsequent punctures must be made. We have never seen any evil results from such punctures during five years' experience, and thus have become as convinced of the safety as of the utility of the measure. If there be more pus present at a given spot than the hypodermic syringe will remove, it is better to introduce the aspirator trocar, and withdraw as much as possible.† The occurrence of a little bleeding in the course of the paracentesis has frequently ceased after the valve has been shut off for a few moments. If, after reopening, blood should continue to flow, it is recommended to stop the aspiration. In most of our cases, aspiration has been performed under anæsthetics. This has appeared to have three advantages: 1. The facility thereby gained for making a thorough exploration; 2. The avoidance of shock and collapse; 3. The avoidance of the troublesome cough, so well known at the conclusion of paracentesis thoracis without anæsthesia. Chloroform, preceded by a small dose of brandy, has appeared to us better than ether for these cases, on account of the avoidance of bronchial flux. We believe strongly that, if anæsthetics are used at all, they should be pushed to complete insensibility. When the effusion is general, we have found again and again the angle of the scapula a better position for puncture than the mid-axillary line. In localised effusions, the puncture ought to be made at the centre of maximum dulness, wherever that may happen to be. In a certain number of cases, there has been excellent recovery after a single aspiration. Seven at least of such cases have been observed. Successful results have been obtained after repetition of the aspiration up to six times. We have never seen albuminous expectoration. If the pus do not become fetid, and if at each successive operation the quantity notably diminish, there seems no reason to limit the number of attempts to cure the empyema by repeated aspiration. If the pus should become fetid, or rapidly reaccumulate in larger quantity, permanent drainage is

† We have not seen any English aspirator equal to that of Dr. Potain, as made by Mathieu of Paris.

recommended. In all cases, it is contended that this should be by a double opening. If possible, the first opening should be made in the front of the thorax, and the second below and internal to the angle of the scapula. A long probe, threaded with a piece of drainage-tube, may be passed downwards and backwards from the first opening, and the second incision made over the point of the probe when it is felt through the integuments. The drainage-tube should then be drawn through and secured by tying the two ends together. We contend that, by the method of double openings, there is the certainty of more complete and rapid evacuation of pus, and consequently of more rapid adhesion of the parietal and pulmonary pleuræ, than by the single opening. We have seen one case where a single opening only was made, and where subsequent closure took place; and it was found afterwards that two separate collections of pus had not been drained by it. The use of double openings and of a through drainage-tube diminishes this risk, although it may not entirely obviate it. We have often seen difficulties arise with respect to evacuation, when a single opening has been made only in the mid-axillary line. Apart from the unfavourable shape of the pleural cavity for drainage, it is important to bear in mind that, when retraction begins to take place, the ribs approximate most in the axillary region, and, in a child especially, there is risk of the intercostal space, through which the tube passes, being so narrowed, that the tube is occluded by the two contiguous ribs. In front and behind, the width of the intercostal space is greater, and undergoes less diminution as the side retracts. Most of the cases with which we have been concerned have been dressed with oakum. We have seldom had need to use stimulant injections; but in one case we saw marked and rapid improvement from the use of a solution of quinine, five grains to the ounce. One of the strongest arguments in favour of the method of double openings is that, in a large proportion of cases, it dispenses with the need of washing out the empyema-cavity. It is well known that washing out the chest has been followed, in a certain number of cases, by sudden death. Of this, fortunately, we have no experience; but we have experience of the terror and distress which the washing out induces (even when performed with an irrigator), and which in children constitutes a serious drawback. In the rare cases where, in spite of double openings, the pus has become fetid, we have

obtained all the advantages derivable from injection by daily placing the little patient in a bath, with warm water sufficiently high to cover the upper opening. This secures a thorough, yet gentle and equable, cleansing of the empyema-cavity, and, moreover, is grateful to the child. Either Condyl's fluid may be added to the water, or very weak solution of carbolic acid. If the latter, we wish strongly to point out the necessity of using carbolic lotion previously prepared with boiling water. When pure carbolic acid has been simply poured into the bath, we have seen some of it float in oily drops on the surface, and give rise to trouble.

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